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## CASE OR RACK FOR PANELS

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

[0001] The present invention relates to case or racks for storing panels, particularly glass panels. The invention also relates to a method for storing said panels.

#### 2. Background Art

[0002] Racks for glass panels usually receive the panels leaning against one another in a near-vertical fashion. Fig.1 illustrates an A-frame and Fig.2 a L-frame, both of which are well known. When these frames are used with different sized panels, the larger panels are usually placed first against the frame, with progressively smaller panels in front. Because the panels are leaning one against another, getting access to the panels placed at the rear generally involves moving all the panels in front, which increases manipulation time and effort as well as the risk of damaging one or several panels.

[0003] Accordingly, there is a need for rack for storing panels which allows easy access to a desired panel.

### SUMMARY OF INVENTION

[0004] It is therefore an aim of the present invention to provide an improved rack for storing panels.

[0005] Therefore, in accordance with the present invention, there is provided a rack for storing panels, comprising a base having a top surface, a rear structure vertically extending from the base, a plurality of supports in at least one of the top surface of the base and the rear structure for supporting the panels in a vertical position, and a plurality of arms extending from the rear structure for engaging top edges of the panels to retain the panels in the vertical position.

[0006] Further in accordance with the present invention, there is provided a method for storing panels within a rack having a base and a rear structure, the method comprising the steps of placing each panel in a vertical position on the base, at least one of a rear edge and a bottom edge of the panel being supported by supports of the rack, engaging a top edge of each panel with a movable arm connected to the rear structure, and locking the movable arm against the top edge of the panel to retain the panel in the vertical position.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Reference will now be made to the accompanying drawings, showing by way of illustration a preferred embodiment of the present invention and in which:

[0008] Fig.1 is a schematic perspective view of a frame for holding panels in accordance with the prior art;

[0009] Fig.2 is a schematic perspective view of a second frame for holding panels in accordance with the prior art;

[0010] Fig.3A is a perspective view of a rack for holding panels in accordance with a first embodiment of the present invention;

[0011] Fig.3B is a perspective view of a rack for holding panels in accordance with a second embodiment of the present invention;

[0012] Fig.4A is a perspective view of a first embodiment of an arm used in the rack of Fig.3A or Fig.3B, in a rotated position;

[0013] Fig.4B is a perspective view of the arm of Fig.4A, in an elevated locked position;

[0014] Fig.5A is a perspective view of a second embodiment of an arm used in the rack of Fig.3A or Fig.3B, in an elevated locked position;

[0015] Fig.5B is a side elevation view of the arm of Fig.5A, showing the arm in the elevated locked position in plain lines and in a rotated position in broken lines;

[0016] Fig.6 is a perspective view of a rack for holding panels in accordance with a third embodiment of the present invention;

[0017] Fig.7 is a perspective exploded partial view showing the installation of an arm in the rack of Fig.6;

[0018] Fig.8A is a side elevation partial view of an arm used in the rack of Fig.6, in a locked position;

[0019] Fig.8B is a side elevation partial view of the arm of Fig.8A, in an unlocked position, and showing a second position of the handle in broken lines;

[0020] Fig.9A is a perspective view of the arm of Fig.8A, with an elongated member for supporting a single panel;

[0021] Fig.9B is a perspective view of the arm of Fig.9A with a different elongated member for supporting two panels.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Referring to Fig.3A, a first embodiment of a rack for holding panels 11 such as glass sheets or sealed glass panel units is generally indicated at 10. The rack 10 comprises a base 12 supported by four (4) vertical posts 14. Members 16 can also be provided to be eventually engaged by the fork of a lift truck and ease the handling of the rack 10. Two (2) of the vertical posts 14, located at the rear side of the base 12, support a rear structure 18 extending vertically from the base 12.

[0023] The rear structure 18 comprises a plurality of horizontal bars 20 and a vertical plate 28 which extend between the rear vertical posts 14. The vertical plate 28 is preferably adjacent to a top surface of the base 12. The horizontal bars 20 are located higher than the plate 28 and are regularly spaced apart. The horizontal bars 20 each include a plurality of aligned slots 22 on a top and a bottom side thereof. A plurality of arms 24, 124 are received between adjacent horizontal bars 20 and retained in corresponding slots 22 in the bottom side of the top bar and

the top side of the bottom bar. The arms 24,124 extend from the rear structure 18 over the base 12. The height of each arm 24,124 can be varied by selectively retaining the arm 24,124 between different adjacent horizontal bars 20.

[0024] A plurality of parallel horizontal grooves 26 are defined in the top surface of the base 12. Each horizontal groove 26 extends substantially perpendicularly to the rear structure 18. A plurality of parallel vertical grooves 30 are defined in the vertical plate 28 such that each vertical groove 30 is aligned with a corresponding horizontal groove 26. Each horizontal groove 26 is preferably sized to receive the bottom edge of a single panel 11, and each vertical groove 30 is preferably sized to receive the rear edge of a single panel 11. However, it is also considered to have grooves 26,30 which each receive more than one panel edge. Advantageously, additional parallel vertical grooves 32 may be provided on a front surface of the horizontal bars 20. Each vertical groove 32 is aligned with the corresponding vertical grooves 32 of the other horizontal bars 20 as well as the corresponding vertical groove 30 of the vertical plate 28. The grooves 26,30,32 form supports which are designed to receive the panels 11 in a vertical position, perpendicularly to the rear structure 18.

[0025] Fig.3B shows a second embodiment of the rack 110. Like in the previous embodiment, the rack 110 comprises a base 112 supported by four vertical posts 114. It further comprises member 116 similar to member 16 of the previous embodiment. A rear structure 118 extends vertically from the base 112 and comprises a plurality of horizontal bars 120 including aligned slots 122. A plurality of arms 24,124 are retained in corresponding slots 122 such as to extend from the rear structure 118 over the base 112. Supports formed of horizontal grooves 126 in the top surface of the base 112, vertical grooves 130 in a vertical plate 128, and additional vertical grooves 132 in a front surface of the horizontal bars 120 receive the panels 11 in a vertical position.

[0026] Additional support is also provided in the rack 110 to receive the panels. This additional support consist in a plurality of parallel rods 134 extending between the top surface of the base 112 and the rear structure 118. The rods 134 preferably extend at an angle of substantially forty-five (45) degrees from the top surface of the base 112. The rods 134 are placed so as to be between adjacent horizontal grooves 126, such that a panel 11 resting in a groove 126 will be supported between two rods 134. Each rod 134 is preferably made of metal and surrounded by soft material such as plastic material, to avoid damage to the panels. The vertical plate 128 containing the vertical grooves 130 can be smaller than in the previous embodiment. The vertical plate 128 can also be omitted.

[0027] Figs.4A-B show a first embodiment of the arms 24 which can be used in the rack 10 as illustrated in Figs.3A or the rack 110 as illustrated in Fig.3B. Each arm 24 comprises a vertical bar 40 which has a U-shaped section and is designed to be received in the corresponding slots 22,122 of the horizontal bars 20,120 of the rack 10,110 (see Figs.3A-B). An elongated body 42 is connected to the vertical bar 40 by a pivot 44. The elongated body 42 includes on a bottom edge thereof a groove (not shown) which is designed to engage a top edge of a panel 11. When the arm 24 is connected to the rear structure 18,118, the groove is aligned with the corresponding groove 26,126 on the top surface of the base 12,112. The arm 24 thus retains the panel 11 in corresponding grooves 26,30,32 or 126,130,132 of the rack 10,110 such as to maintain the panel 11 within the grooves in a vertical position. Alternatively, as illustrated, the vertical bar 40 may comprise two distinct parts. A first part having a U-shaped section. Another part being a vertical member extending at both ends of the first part to define tongues for engagement with slots 22, 122.

[0028] A locking mechanism 46 prevents the arm 24 from pivoting upwards and releasing the panel 11, and can also serve to retain the arm 24 in a somewhat horizontal position

when it is not resting against a panel. The locking mechanism 46 includes an angled finger 48 and a ring 50. The angled finger 48 is integral with the elongated body 42 and forms an acute angle therewith such as to extend up and toward the free end of the arm 24. The angled finger 48 is sized so as to penetrate within the U-shaped section of the vertical bar 40 when the arm 24 is sufficiently pivoted upward. The ring 50 closely surrounds the vertical bar 40 and is free to move in a vertical direction. Thus, when the arm 24 is rotated down about the pivot 44, the angled finger 48 is moved away from the vertical bar 40, allowing the ring 50 to slide down between the finger 48 and the vertical bar 40, as illustrated in Fig.4A. When the arm 24 is sufficiently rotated up about the pivot 44 such that the finger 48 is contained within the vertical bar 40, the ring 50 can be slid down so as to retain the finger 48 within the bar 40, thus maintaining the arm 24 in a somewhat horizontal position as illustrated in Fig.4B.

[0029] In use, the ring 50 is brought upward to free the finger 48 so that the arm 24 can be rotated about the pivot 44. As illustrated in Figs.3A-B, a panel 11 is placed such that its bottom edge and rear edge are received in corresponding grooves 26,30,32 or 126,130,132 of the rack 10,110. The arm 24 is then rotated down until the groove of the elongated body 42 receives the top edge of the panel. While the arm 24 rotates down, the ring 50 slides down between the vertical bar 40 and the finger 48. The ring 50 will then prevent the finger 48 from moving back toward the vertical bar 40, thus preventing the arm 24 from rotating back up, as illustrated in Fig.4A. The locked arm 24 will insure that the panel 11 is retained in the grooves 26,30,32 or 126,130,132 of the rack. To unlock the arm 24 against a panel, the ring 50 is moved upwardly, the arm 24 is rotated upwardly and the ring 50 is engaged on the finger 48.

[0030] Figs.5A-B show a second embodiment of the arms 124 which can be used in the rack 10 as illustrated in Figs.3A or the rack 110 as illustrated in Fig.3B. Like in the

previous embodiment, each arm 124 comprises a U-shaped vertical bar 140 to be received in the corresponding horizontal bar slots 22,122. An elongated body 142, connected to the vertical bar 140 by a pivot 144, includes on a bottom side thereof a removable elongated member 152 with a groove 154 designed to engage the top edge of a panel 11. Alternatively, the elongated member 152 can be replaced by a second elongated member having, for example, a groove of a different width, or two grooves such as to support two panels with a single arm. Alternatively, the vertical bar 140 may be similar to the vertical bar 40 previously defined.

[0031] The arm 124 may also includes a handle 160 to facilitate manipulation. The handle 160 preferably comprises a metal plate 162 which is retained on the back of the arm 124 by two bolts 164.

[0032] A locking mechanism 146 prevents the arm 124 from pivoting upwards and releasing the panel 11. The locking mechanism 146 includes a finger 148 provided on the top of the elongated body in proximity to the vertical bar 140. The locking mechanism 146 also includes a tapered member 156 which is inserted in a groove on top of the elongated body 142 and attached to the body 142 by a pivot 158. The wider end of the tapered member 156 is adjacent to the finger 148, with the finger 148 extending higher than the tapered member 156 when the member is in an equilibrium position with respect to the pivot 158. The locking mechanism 146 also includes a ring 150 closely surrounding the vertical bar 140 and, when the arm 124 is not in use, retaining the finger 148 within the vertical bar 140 to maintain the arm 124 in a somewhat horizontal position, as shown in Fig.5A and in plain lines in Fig.5B. When the ring 150 is disengaged from the finger 148, the arm 124 freely rotates down about the pivot 144 while the ring 150 slips between the elongated body 142 and the vertical bar 140, as shown in broken lines in Fig.5B.



[0033] Before use, the ring 150 is slid upward to release the finger 148 so that the arm 124 can be rotated. The ring 150 can be slid upward by pressing down against the tapered end of the tapered member 156. The tapered member 156 will thus rotate around the pivot 158, bringing the larger end of the tapered member 156 up, which will lift the ring 150 and release it from the finger 148. The arm 124 is then used similarly to the arm 24, i.e. the arm 124 is rotated up about the pivot 144, a panel 11 is placed with its bottom edge and rear edge in corresponding grooves 26,30,32 or 126,130,132 of the rack 10,110, and the arm 124 is rotated down until the groove 154 in the elongated member 152 of the elongated body 142 engages the top edge of the panel 11. The ring 150, by slipping between the arm 124 and the vertical bar 140, will prevent the arm 124 from pivoting back up as illustrated in Fig.5A, insuring that the top edge of the panel 11 remains in the groove 154 of the arm 124. The panel 11 is thus efficiently retained in the grooves 26,30,32 or 126,130,132 of the rack 10,110 by the arm 124. To unlock the arm against a panel, the ring 150 is slid upwardly, the arm 124 is rotated upwardly and the ring 150 is engaged on finger 148. Advantageously, it is possible to unlock the arm 124 from the front of the rack.

[0034] Referring to Fig.6, a third embodiment of the rack 210 is shown. The rack 210 also comprises a base 212 supported by four vertical posts 214. Members 216 are similar to member 16 previously defined. A rear structure 218 extends vertically from the base 212. The rear structure 218 of this embodiment comprises two spaced apart horizontal bars 220, which include aligned slots 222 in a top and a bottom surface thereof. A plurality of arms 224 are retained by the two horizontal bars 220 in aligned slots 222 such as to extend from the rear structure 218 over the base 212. Like in the previous embodiments, supports formed of horizontal grooves 226 in the top surface of the base 212, vertical grooves 230 in a vertical plate 228, and additional vertical grooves 232 in a front surface of the horizontal

bars 220 receive the panels in a vertical position. Like in the rack 110, a plurality of parallel rods 234 extending between the top surface of the base 212 and the rear structure 218 can also be provided.

[0035] The height adjustment of the arms, which was discrete and limited to the installation of each arm between a desired pair of horizontal bars in the previous embodiments, is provided here directly by the arm design. As shown in Figs.6-7, each arm 224 comprises a vertical bar 240 which is designed to be received in the corresponding slots 222 of the horizontal bars 220 and retained therein by pins 223. An elongated arm body 242 is slidably mounted on the vertical bar 240 by receiving the bar 240 in a slot slightly spaced apart from the rear end of the body 242. The height of the arm 224 can thus be easily varied by vertically sliding the arm 224 on the vertical bar 240.

[0036] Referring to Fig.8A-B, a locking mechanism 246 blocks the arm 224 at a desired height on the vertical bar 240. The locking mechanism 246 comprises a pair of ears 270, the first ear 270 extending vertically upward and the second ear 270 extending vertically downward from the rear end of the elongated body 242. Each ear 270 supports a lever 272 connected thereto by a pivot 274. Each lever 272 has a first end 276 and a second end 278, with the second ends 278 being angled away from one another. Both first ends 276 are connected together by a spring 280 which forces them toward one another. The force of the spring 280 brings the first ends 276 in contact with the vertical post 240 such as to retain the arm 224 at a desired height, as shown in Fig.8A.

[0037] The locking mechanism is released by bringing the second ends 278 toward one another against the resistance of the spring 280. This effectively rotates the levers 272 about the pivots 274 such that the first ends 276 are displaced away from one another and from the vertical post 240. While the contact between the first ends 276 and the vertical post 240 is broken, the arm 224 can freely slide up and down on the vertical post 240, as shown in Fig.8B

[0038] Although the second ends 278 can be brought toward one another by exerting a direct force thereon, such as by a pinching motion, they can also be brought toward one another through a release system from the front end of the elongated body 242. The release system comprises first and second wires 282, 284. The first wire 282 has one end connected to each of the second ends 278 of the levers 272. The first wire 282 must be long enough so as not to prevent the pivoting motion of the levers 272 caused by the spring 280 pressing the first ends 276 against the vertical bar 240. The second wire 284 is attached to the middle of the first wire 282 and extends within the elongated body 242, with a free end of the second wire 284 coming out at the front end of the body 242. Preferably, a loop 286 is formed in the free end of the second wire 284 to facilitate manipulation (see Figs. 9A-B). A pulling force applied on the second wire 284 through the loop 286 pulls on the middle of the first wire 282. The two ends of the first wire 282, and thus the second ends 278 of the levers 272 they are attached to, are brought toward one another, as can be seen in Fig. 8B. Therefore, it is possible to manipulate the arm 234 from the rear or the front of the rack 210.

[0039] It is also considered to replace the first wire 282 by equivalent mechanical means, such as a pair of members pivotally connected to one another and pivotally connected to a respective one of the second ends 278 of the levers 272.

[0040] Each arm 224 also includes a handle 260 to facilitate manipulation. The handle 260 comprises a grip portion 266 including a slot 267 which engages a bolt 268 connected to a member 269 extending from the elongated body 242. This provides a sliding and pivoting connection between the grip portion 266 and the member 269. By sliding the bolt 268 in the slot 269, the handle 260 can slide and pivot down when it is not used, thereby minimizing the space taken by the arm 224, as illustrated by the broken lines in Fig. 8B.

[0041] As illustrated in Figs.9A, the elongated body 242 of each arm 224 includes on a bottom edge thereof a removable elongated member 252 having a groove 254 which is designed to engage a top edge of a panel 11. Fig.9B shows an alternative elongated member 252' which includes two grooves 254' to support two panels with a single arm 224.

[0042] In use, while the arm 224 is sufficiently high so as to be out of the way, a panel 11 is placed with its bottom edge and rear edge in the corresponding grooves 226,230,232 of the rack 210. The locking mechanism 246 is disengaged by bringing the second ends 278 of the levers 272 toward one another using one of the described methods. The arm 224 is slid down until the groove 254 of the elongated member 252 engages the top edge of the panel 11. The second ends 258 of the levers 272 are released and the locking mechanism 246 is automatically engaged, the spring 280 bringing the first ends 276 in contact with the vertical bar 240 to prevent the arm 224 from vertically moving. The locking mechanism 246 thus insures that the top edge of the panel 11 remains in the groove 254 of the elongated member 252, so that the panel 11 is retained in the grooves 226,230,232 of the rack 210.

[0043] Although in all embodiments only a few arms have been illustrated for clarity, it is to be understood that an arm can be provided for every set of aligned slots in the horizontal bars, so that a panel can be retained in every set of corresponding grooves.

[0044] In all embodiments, the elements of the rack are preferably made of metal, with the exception of the elements coming in contact with the panels, such as the elongated member of the arms and the grooves in the top surface of the base and in the rear structure which are preferably made of plastic to avoid damage to the panels. A preferred plastic is high density polyethylene (HDPE). A preferred dimension for the arms is 40 by 2½ by ¾ inches.

[0045] It can be seen that in all embodiments of the present invention, the panels are retained by the arms

either individually or in small groups. Thus, an individual panel, or a small group of panels, can be removed from the rack by disengaging the corresponding arm, without the need to displace or access the other panels retained on the rack. The present invention therefore allows for easy and selective access to a desired panel, or small group of panels, regardless of the number and disposition of the other panels within the rack.

[0046] Additionally, walls can be provided between the vertical posts 14,114,214, such as to obtain a closed structure containing the panels. To facilitate access to the panels, the front wall should preferably be completely removable or hingedly connected to another wall. Also, reinforcing members can be provided on the rack, for example supplementary horizontal bars extending between the vertical posts, according to the weight of the panels to be transported within the rack.

[0047] Although the panels have been described as glass panels, the present invention can also be used to stock and transport various types of paneling, including, but not limited to, plastic, wood, and metal panels.

[0048] The embodiments of the invention described above are intended to be exemplary. Those skilled in the art will therefore appreciate that the forgoing description is illustrative only, and that various alternatives and modifications can be devised without departing from the spirit of the present invention. In particular, elements from different embodiments could be combined to form a different embodiment. Accordingly, the present is intended to embrace all such alternatives, modifications and variances which fall within the scope of the appended claims.